Vertebrate Presynaptic Active Zone Assembly: a Role Accomplished by Diverse Molecular and Cellular Mechanisms

Torres, Viviana I.; Inestrosa, Nibaldo C.

Abstract

Among all the biological systems in vertebrates, the central nervous system (CNS) is the most complex, and its function depends on specialized contacts among neurons called synapses. The assembly and organization of synapses must be exquisitely regulated for a normal brain function and network activity. There has been a tremendous effort in recent decades to understand the molecular and cellular mechanisms participating in the formation of new synapses and their organization, maintenance, and regulation. At the vertebrate presynapses, proteins such as Piccolo, Bassoon, RIM, RIM-BPs, CAST/ELKS, liprin-α, and Munc13 are constant residents and participate in multiple and dynamic interactions with other regulatory proteins, which define network activity and normal brain function. Here, we review the function of these active zone (AZ) proteins and diverse factors involved in AZ assembly and maintenance, with an emphasis on axonal trafficking of precursor vesicles, protein homo- and hetero-oligomeric interactions as a mechanism of AZ trapping and stabilization, and the role of F-actin in presynaptic assembly and its modulation by Wnt signaling.

Keywords

Bassoon CAZ CAST ELKS F-actin Liprin-α Munc13 Piccolo RIM RIM-BPs Wnt